

Inherent, personal data

CONTAINS NO ORN

8-274-278

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Toxicity of Methyl Bromide.

86-870004139

The accompanying report summarizes the pertinent information on the toxic action of methyl bromide.

In Table I methyl bromide is compared with other toxic materials. This information for comparison was obtained from "Noxious Gases" by Henderson and Haggard.

It will be observed that methyl bromide is a toxic material and that precautions must be observed in its use. However, it compares favorably with other materials used for fumigation and would be correspondingly less hazardous.

Table I.

Concentration of vapors of some toxic materials showing equal physiological action.

Reaction	CCl ₄	CS ₂	SO ₂	HCN	KaBr
Slight symptoms after several hours.	0.10%	0.032 - 0.050%		0.002 - 0.004%	0.002 - 0.01%
Maximum concentration for prolonged exposure			0.01 - 0.001%		
Maximum concentration for 1 hr. without serious disturbance.	0.4 - 0.6%	0.048 - 0.080%	0.008 - 0.01%	0.005 - 0.006%	0.1%
Dangerous after 30-60 minutes	2.4 - 3.2%	0.11%	0.04 - 0.06%	0.012 - 0.015%	0.2 - 0.4%
Rapidly fatal	4.8 - 6.3%		0.2%	0.30%	2 - 4%

Standard Values

No. 1 Sample Cup Volume = 1.5 cc.
No. 2 Sample Cup Volume = 1.0 cc.
No. 3 Sample Cup Volume = 0.7 cc.

Cylinder No. 1 contains:

Methyl bromide
Methyl bromacetate
% warning agent =

520 gms.
2.5 gms.
0.5%

Cylinder No. 2 contains:

Methyl bromide
Methyl bromacetate
% warning agent =

500 gms.
1.25 gms.
0.25%

Cylinder No. 3 contains:

Methyl Bromide
Methyl bromacetate
% warning agent

500 gms.
0.3 gms.
.06%

Cylinder No. 4 contains:

Methyl bromide
Methyl mercaptan
% warning agent

500 gms.
0.9 gms.
.02%

Estimations

Volume Used	PPM MeBr	PPM Warning Agent			
		No. 1	No. 2	No. 3	No. 4
1.5 cc.	200	1.0	0.5	.12	.04
1.0 cc.	130	.7	.35	.08	.03
.7 cc.	100	0.5	.25	.06	.02

2-7-38
VC

The study of the effectiveness and sensitivity of certain warning agents to be used in methyl bromide shows that ethyl monobromacetate was the most effective in regards to lachrymatory action while methyl mercaptan proved most effective from an odorant point of view.

These tests were carried out in a gas chamber containing about 100 cu. ft. of air space on two or three observers in concentrations of from 0.5-9 parts per million in air. Methyl bromide was not used in any of these tests.

The accompanying table gives the results obtained in the order of their apparent decreasing effectiveness.

On the bases of these tests it is recommended that if the warning agent to be used be of the type that will require evacuation, the ethyl monobromacetate should be used. If, however, only detection is to be noted, methyl mercaptan is the logical one to employ.

**1-27-38
JQ**

<u>Effect- iveness</u>	<u>Compound</u>	<u>Observation</u>	<u>Affects</u>	<u>B.P. °C.</u>	<u>M.W. gm/100</u>	<u>Den.</u>	<u>Lb./1000 $\times 10^{-4}$</u>	<u>PPM</u>
1.	Ethyl bromacetate	Three observers started crying immediately and came out of the chamber in fifteen seconds. The effect is accumulative—the longer the time, the more the irritation.	eyes	159	167	1.48	2	0.2
2.	Acrolein (33% in alcohol)	Two observers immediately noted a strong odor and irritation of the nose. Both were able to stay in the chamber longer than one minute. The effect remains more or less at the same intensity.	nose	52	56	0.84	.6	0.2
3.	Methyl mercaptan	Two observers noted a very strong characteristic odor. There was no apparent decrease in sensitiveness after contact. In a concentration estimated to be about one part in 10-20 million it was noted that the odor was quite strong.	nose	6	48	0.89	1.2	0.2
4.	Chloropierin	Two observers noted a strong irritation in eight seconds. The irritation decreased with contact. Apparently a certain fatigue sets in in this test.	eyes	112	164	1.65	3	0.2

(cont'd.)

<u>Effect- iveness</u>	<u>Compound</u>	<u>Observation</u>	<u>Affects</u>	<u>B.P. °C.</u>	<u>M.W. gm/100</u>	<u>Den.</u>	<u>Lb./1000</u>	<u>PPM</u>
5.	Ethyl mercaptan	Two observers noted a strong odor but fatigue occurred and observers soon became more or less acclimated to the gas.	nose	35	62	0.84	1.6	0.5
6.	Calodorant	Two observers noted a strong odor but fatigue occurred and observers soon became more or less acclimated to the gas.	nose	-	-	-	2	1.5
7.	Methyl chloracetate	Two observers noted a mild increase in irritation. One observer was able to remain in the gas longer than three minutes.	eyes	131	108	1.23	27	1.5
8.	Ethyl chloracetate	Two observers noted a mild increase in irritation. One observer was able to remain in the gas longer than three minutes. No effect was noted in concentrations of one part per million.	eyes	144	122	1.15	14	1.5

METHYL BROMIDE

The acute vapor toxicity of methyl bromide for guinea pigs has been studied at the Bureau of Mines and results have been published in Public Health Bulletin #185. We have studied the chronic vapor toxicity of methyl bromide for cavies, rats, rabbits and monkeys. The following tables present the essential information that has been obtained.

AFFECTS OF METHYL BROMIDE WHEN ABSORBED THROUGH THE LUNGS

a. From Sayers and Yant, U. S. Public Health Bulletin #185.

Animal	Length of exposures	Concentration	Effect Observed
Guinea pig	10 min.	20,000 ppm	Death within 24 hrs.
" "	10 "	5,000 "	Slight injury
" "	30 "	5,000 "	Death within 24 hrs.
" "	1.5 hrs.	600 "	No injury observed
" "	3 hrs.	600 "	Death within a week
" "	2.5 hrs.	300 "	No injury observed
" "	10 hrs.	300 "	Death within a week
" "	5 hrs.	100 "	No injury
" "	10 hrs.	100 "	Slight effect

b. Exposures 7-8 hours, 5 days a week. (International Research Lab.)

Animal	Concentration	Effect Observed
Guinea pigs	100 ppm.	Many survived 6 months. Some died, particularly pregnant females with late abortions.
Guinea pigs	60 ppm.	No definite effect observed in 6 months.
Guinea pigs	30 ppm.	No definite effect observed in 6 months.
Rats	100 ppm.	Many died (in 15-30 days), some with definite nervous symptoms. A few survived for 6 months.
Rats	60 ppm.	No effects observed in 6 months
Rats	30 ppm.	" " " " "
Rabbits	100 ppm.	Paralysis and death in 1-2 weeks
Rabbits	60 ppm.	" " " " 15-30 days
Rabbits	30 ppm.	" " " " "
Monkeys	60 ppm.	1 monkey died after 30 exposures 1 monkey was severely paralyzed after 25 and one after 57 exposures.

The rabbits and monkeys recover completely from the paralysis if exposures are terminated. One monkey has recovered completely from 2 successive p alyses.

The following table presents a summary of the acute vapor toxicities of several common materials permitting a comparison with the acute vapor toxicity of methyl bromide.

It will be observed that methyl bromide is a toxic material and that precautions must be observed in its use. However, it compares favorably with other materials used for fumigation and would be correspondingly less hazardous.

c. Concentration of vapors of some toxic materials showing equal physiological effect.

Reaction	(1)	(2)	(1)	(1)	(2)
Slight symptoms after several hours	0.033-0.075%	0.033-0.075%	0.01-0.001%	0.005-0.001%	0.005-0.017%
Maximum concentration for prolonged exposure			0.01-0.001%		
Maximum concentration for 1 hr. without serious disturbance	0.4-0.6%	0.048-0.080%	0.005-0.01%	0.005-0.006%	0.1%
Dangerous after 30-60 minutes	2.4-3.2%	0.115%	0.04-0.05%	0.015-0.015%	0.2-0.2%
Rapidly fatal	4.8-6.3%		0.2%	0.3%	4.4%

(1). Henderson and Haggard, "Noxious Gases".

(2). U. S. Public Health Bulletin #185

We have outlined some preliminary recommendations to be followed until some information can be found which will change our present opinion. These recommendations are as follows:

50 ppm: Roughly 0.015 lb/1000 cu.ft. Daily exposures of 7-8 hours (possibly longer) may be had for an indefinitely long period of time.

100 ppm: Safe for several successive daily exposures, but they should not be repeated too frequently.

200 to 400 ppm: Should be safe for several hours of exposure, if not repeated too frequently. (Note: In all cases heavy work should be avoided as it causes much greater intake.)

1000 ppm: Is dangerous for over 1 hour exposure, but no serious damage should be experienced from shorter exposures if not repeated too frequently.

AMM:R

Biochemical Research Laboratory

Brom methane was sprayed intermittently for five minutes on the shaven abdomen of rabbit #2-136. A mist of fine drops came into contact with the skin and immediately vaporized. The skin was chilled to a considerable extent.

After 24 hours there was a definite redness of the treated area and a marked edema. This reaction disappeared within the following 24 hours, the skin appearing normal 48 hours after the treatment.

Application of Brom methane would appear to be followed by a marked local reaction characterized by redness and edema. This reaction is more severe than would be expected from the cooling effect alone. There was apparently no lasting damage or systemic reaction.

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